

Heat ratio method to measure sap flow in palm trees

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A reliable tool to measure water use in palm trees is needed for the management of palm crops. Thermometric sap flow methods are preferred because they hold many advantages over other direct estimates of transpiration. Countless studies have shown that thermometric methods are extremely useful for studies of whole plant water use, physiology, water stress, water use efficiency etc. Despite all these applications, thermometric sap flow methods remain largely unproven in monocots including many species of palms. Hence, the objective of this experiment was to evaluate the suitability of Heat Ratio Method (HRM) in order to study the whole plant water use by comparing water use measurements using a gravimetric weighing lysimeter.

The experiment was conducted under ambient condition in a glass house and the measurements were made on five-year-old potted cocos palm trees (*Syagrus romazoffiana*), which was placed on a lysimeter. Heat pulse velocity and the gravimetric water loss were recorded at 10 minutes intervals and pooled to calculate at hourly intervals.

The hourly sap flow measured by HRM corresponded closely to that measured gravimetrically by the lysimeter ($r^2 = 0.84$; $p > 0.0001$; Figure 3-a). The daily average water loss measured by the gravimetric method showed much better correlation with daily average thermometric sap flow measurements ($r^2 = 0.91$; $p > 0.0001$). Daily average sap flow measured by HRM showed a response to drying and wetting cycles imposed during the experimental period. Younger fronds seemed to have a higher demand for water than mature fronds and all four fronds showed a similar pattern of sap flow despite the rates being different among fronds. Results indicated that HRM method could be used to measure the sap flow in palms.

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